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AUTHOR Holmes, William H.
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ABSTRACT

Two-year colleges, comprising America's largest advanced skill training network, are facing an information-handling crisis due to the current technology revolution. Four primary issues must be faced by community colleges if they are to narrow the gap between their educational services and societal shifts brought on by rapid technological advancement: (1) avoiding the obsolescence of faculty, facilities, equipment and curricula; (2) projecting and meeting the dramatic increases in fiscal requirements for equipment and instructional and administrative software; (3) using new technologies innovatively to improve traditional instructional delivery systems and to initiate new alternative instructional delivery systems; and (4) upgrading administrative services in colleges to keep pace with business and government counterparts. In their efforts to deal with these information-age issues and to meet the educational requirements of grassroots America, community colleges need information processing equipment and software in the areas of high-tech applications, vocational and general education computer support, administrative support systems, and technology transfer networks. (Author/LAL)

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TECHNOLOGICAL SUPPORT

for

COMMUNITY COLLEGES IN AMERICA

A CONCEPT PAPER

Prepared by
William H. Holmes
Manager of Development

Community Colleges of Spokane
Spokane, Washington

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TECHNOLOGICAL SUPPORT
for
COMMUNITY COLLEGES IN AMERICA

EXECUTIVE SUMMARY

Two-year colleges comprise America's largest advanced skill training network and the major provider of lower division college education. Twelve-hundred community, technical and junior colleges located in all 50 states served more than 11 million Americans in 1983-84.

Community, technical and junior colleges are grassroots, community-based organizations that are highly responsive to unique and changing education marketplaces. Their mission is the human and economic resource development of their communities, and thus, of America.

To accomplish their mission, two-year colleges form linkages with their consumers (business, industry, associations and demographic groups) and with other education service providers resulting in direct, hands-on educational offerings.

The current technology revolution is producing an information-handling crisis for higher education, whereby computer processing and rapid technology transfer in the society demand rapid changes in curricula, instructional equipment and teaching methods.

Dramatic employment shifts due to technological changes will increase the need for community college vocational training and retraining for entry-level and service jobs.

There are four primary issues that must be faced by community colleges if they are to narrow the gap between their educational services and societal shifts brought on by rapid technological advancement.

1. Avoidance of the obsolescence of faculty, facilities, equipment and curricula.
2. Projecting and meeting the dramatic increases in fiscal requirements for equipment and instructional and administrative software.

3. Innovative use of new technologies to improve traditional instructional delivery systems and to initiate new alternative instructional delivery systems.
4. Upgrading administrative services in colleges to keep pace with our counterparts in business and government.

Technology transfer is the overriding concern of community colleges in delivering services in the midst of this new information age. There is an information glut in our society that prevents technical knowledge users from accessing solutions to their concerns. A national technology transfer system that sorts technical information data bases by user categories would permit the flow of extremely valuable information to business, industry, communities and groups throughout our country.

Community colleges need information processing equipment and software in four key areas, in order to meet the educational requirements of grassroots America.

1. High-tech applications: establishment of CAD/CAM/CIM demonstration centers linked to industry.
2. Vocational and general education computer support: mini-clusters or micro stand-alones in every classroom and lab at every community college in America.
3. Administrative support systems: information management computer systems to make administrative services more effective at a cost savings.
4. Technology transfer networks: creation of a national technical information system utilizing community colleges for delivery and retrieval of information.

TECHNOLOGICAL SUPPORT
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INTRODUCTION

Community, technical and junior colleges may be America's best kept secret. While there are over 1,200 of these colleges operating in all 50 states, serving over 11 million American citizens in the 1983-84 academic year, there still is a lack of a clear understanding of what community, technical and junior colleges are and what their mission is in the higher education community.

Perhaps this lack of understanding is due to the newness and innovative work of two-year colleges in America. As locally governed and individualistic colleges, it has been difficult for community, technical and junior colleges to develop a national image. While being strongly attuned to the needs of their own communities, two-year colleges in America have grown into the nation's largest advanced skill training network outside of industry itself. Employers in both private and public sectors are asking community colleges to offer more and more skill-specific courses typically consistent with the general aim of increasing American productivity.

As the cost of a college education continues to climb, many more students are electing to complete their first two years of higher education at the local community college. Informal surveys of community college graduates competing at four-year institutions indicate that they do very well, and in many instances, surpass the averages attained by students who started at four-year colleges.

These trends mean that today more Americans starting college are served by two-year community colleges than by all other segments of higher education combined. The great majority of the five million students studying for credit and degrees at the community colleges are working adults, with an average age of approximately 30, and more than three million of these are enrolled in occupational courses.

The trend to greater utilization of community colleges is economically cost effective as demonstrated by the fact that in 1983-84, four-year colleges in the state of Washington

expended $5,274 per FTE per year while community colleges spent only $2,590 for the same FTE per year, according to the Washington Council for Postsecondary Education.

Community, technical and community colleges are flexible and diverse because they are community-based institutions that respond with programs and services tailored to their specific populations and industries. Community colleges teach 1,400 different occupations, most of which result in terminal degrees. In addition, approximately 25 percent of community college students transfer to four-year colleges and universities, either for additional occupational training or to complete four-year degree programs.

Community, technical and community colleges also arrange and conduct special courses and programs for employers, labor unions, professional and civic organizations and community groups. In some locations, these special programs are grouped together as a "college without walls." At Community Colleges of Spokane, for example, the Institute for Extended Learning organizes continuing education courses in over 50 locations of a six-county area covering more than 12,000 square miles.

When all of the mission statements and mandates assigned to community colleges across the United States are boiled down to a simple perspective, a statement such as, "The mission of community colleges is the grass roots human and economic development of America" is a fairly representative, if general, statement. The dynamic implications of the statement, however, are real and are operating every day in the community college system.

PARTNERSHIPS FOR CHANGE

Community, technical and junior colleges comprise a service industry that has broad responsibility for meeting the education and training needs of their highly complex communities. To accomplish their service goals, it is essential that these colleges cultivate linkages with their consumers, as well as with other service providers, including other higher education institutions, corporations, proprietary training institutions, labor union apprenticeship programs, the military, libraries, museums, associations and federally sponsored agencies and programs.

Community, technical and junior colleges are in the forefront of higher education's direct hands-on involvement with economic development in the United States. This involvement is direct because community colleges are training students in occupational programs that must be responsive to the employment needs and skill levels required by corporations. It is hands-on because community colleges provide numerous direct services to businesses that require these services in order to survive and grow.

It is almost trite to talk about the dramatic changes occurring in the U.S. economy over the past several years. The new economy is an information economy because the majority of jobs in it are information occupations. According to the AACJC report "Putting America Back to Work: The Kellogg Leadership Initiative," currently more than 60 percent of the American work force is employed in information occupations. The AACJC report cites four significant elements of economic change:

1. The shift from blue collar to white collar jobs, starting in 1957.
2. The growth of service industries in comparison with static manufacturing industries.
3. The emergence of high technology and robotics in industry, and the decline of labor-intensive mass production.
4. The proliferation of information industries and the stagnation of production industries.

In the arena of jobs development, the AACJC report points out that high-tech occupations are expected to increase more than 100 percent by 1990, which is more than four times the employment growth rate of all occupations. However, the greatest number of new jobs in this period of time will be produced in lower skill areas, such as facility maintenance, nurse aides, sales clerks, cashiers, waiters and waitresses. According to the U.S. Department of Labor, the 92 industries they classify as high tech or high tech intensive will increase their employment by 850,000 jobs by 1990, which represents only 4 percent of the total non-agricultural labor force. By contrast, the most jobs available in this period will be in non-technical occupations. One-third of all new jobs will be for operatives. Clerical and management occupations will occupy one-fifth of the new jobs, and other categories--such as engineers, craft workers, engineering and science technicians--will hold a full 40 percent of the jobs available in 1990.

To put the growth of high-tech jobs in perspective, the Bureau of Labor Statistics points out that the number of high-tech jobs created over the next decade will be less than half of the two million jobs lost in manufacturing during the past three years. High-tech industries will generate ten times the number of jobs expected from the rest of industry, according to the Bureau of Labor Statistics, but they will be in traditional occupations, rather than technical ones.

Training and retraining of our human resources may be the one clear picture that emerges from the pieces of the technological revolution puzzle we are facing. The basic higher education and technical training available through community, technical and junior colleges, plus their intimacy with the populations in their service areas, make these institutions the primary resource of the American education system in developing our nation's human resources.

TRENDS

With human resources development as a primary mission of community, technical and junior colleges, it is essential that these institutions watch and be responsive to major shifts in societal patterns that affect the educational needs of the general public. Business and industry are rapidly adopting new information technologies -- primarily computer and telecommunications advances -- at such a rate that there is a growing gap between the educational system and the society it serves. The AACJC in its public policy agenda for 1985 (AACJC Journal, February 1985, p. 52) cites four primary issues that must be faced by community colleges:

1. Avoidance of the obsolescence of faculty, facilities, equipment and curricula.
2. Projecting and meeting the dramatic increases in fiscal requirements for equipment and instructional and administrative software.
3. Innovative use of new technologies to improve traditional instructional delivery systems and to initiate new alternative instructional delivery systems.
4. Upgrading administrative services in colleges to keep pace with our counterparts in business and government.

Avoiding Obsolescence

Community college faculty traditionally are closer to the marketplace than any other higher education faculty; however, they must be exposed to the new technologies being applied in their areas of expertise. This exposure will come primarily in three ways:

1. Workshops and seminars that are aimed at upgrading information exposure and skill development.
2. Regular release time for faculty to participate with business or industry in learning the applications of new technology.
3. The acquisition of new technologies for use in the classrooms.

Facilities and equipment obsolescence is a problem that is very difficult to resolve because they are capital-intensive. Making facilities multipurpose and flexible can help accommodate new technology as it becomes available. Sharing facilities with businesses and industries that utilize community college services would make facility dollars stretch farther. Also, renting and leasing space on an as-needed basis would permit the college to orient their facilities to the teaching needs of the institution, rather than the other way around.

Ownership is the key issue to the obsolescence of equipment. While it is true that some fixed equipment for accessing new information technologies must be owned, much instructional technical equipment could be acquired on another basis. Arrangements could be made with vendors and industry to provide state-of-the-art equipment for instructional purposes by consignment or on loan. This way, the ownership never changes hands while the students and faculty who must become familiar with the equipment have access to it when new equipment goes on the market.

Obsolete curricula are the result of isolating the classroom from the workplace. If faculty are current with new technological advances and state-of-the-art equipment is available for use in the classroom, then the curricula will be current and germane to the real world.

Projecting Fiscal Requirements

Projecting fiscal requirements for equipment and software in the midst of this technological revolution will be difficult at best. However, if community, technical and junior colleges strike partnership agreements with industry and other users of their services, hardware can be borrowed or consigned according to current program needs.

Software development for instructional purposes is being made available more rapidly than it can be utilized by institutions. Some community college faculty are heavily involved in writing their own software. The software issue is more of a technology transfer problem than a curriculum development problem. Two-year colleges should be exploring with software developers the possibility of general licensing that would give them access to specific software for instructional purposes.

Instructional Delivery Systems

Changing instructional delivery systems is a core issue for community colleges in the new information-age technology. Decentralization and partnerships are two key factors in considering instructional delivery systems. The computer and telecommunication advances make it possible for the classroom to be moved from an educational campus setting to the work site. If community colleges are to play a significant role in training and educating for the technological age, they must be flexible enough to change the curriculum to meet the needs of the people they serve and take their services directly to where those people work and live.

Business technology, for instance, can be moved from a campus to an industrial or business park or could share facilities with a business incubator. Such a move would permit the college to address the specific needs and issues of people in business and at the same time provide students who are yet to be employed with an invaluable learning environment.

Self-teaching is a movement that has begun to affect the delivery systems of community colleges. Open-entry/open-exit curricula are being written for computers to permit students in virtually any academic discipline to complete knowledge transfer

assignments with minimal interaction with a faculty person. Interactive video discs and other forms of technology also provide opportunities for self-teaching.

Administrative Service Utilization of Technology

To discover the depth of application of new technology tools in any given community college, one needs to look at the administrative area. The first needs to be met in most community colleges are in the delivery of academic services. Only after high-tech tools are available in sufficient quantity for academic purposes is the institution likely to meet its administrative needs. Unfortunately, few community colleges have yet reached the point where they have state-of-the-art high-tech administrative tools.

Financial management systems, for example, are only now coming on line at many community colleges. Many more still handle financial management manually. Likewise, student services management systems often depend upon computer programs and other tools that are outdated and ineffectual. In some community college systems, inventory control is still a matter of hand-counting and manual tabulation with only gross records maintained on a general-use computer program. Business and industry have been making great strides in managing energy efficiency via computer control, while very few community colleges have the computer power or expertise to enter this area of economy. The net effect of delayed utilization of computers for administrative control is wasted resources -- human, natural and financial.

TECHNOLOGY TRANSFER

Technology transfer is probably the area of greatest need when one examines the impact of information-age technology on community colleges. There is an overwhelming amount of information available for business and industry application and to meet the general education needs of the public. The task of translating these volumes of information into usable knowledge is one of the primary concerns of the American community college system.

Dr. C. Nelson Grote, chief executive officer of the Community Colleges of Spokane, addressed this issue in an article written for the AACJC Journal. Grote proposed that the community colleges of America become the technology transfer agents for the United States, much in the same way that Cooperative Extension Services of land grant colleges became the knowledge transfer agents for meeting the agricultural needs of rural America in the 1930s. With community colleges acting as the agent, a cooperative technology extension service would provide a delivery system that interfaces the resource and development community with people and problems at the local level.

The overall goal of a technology transfer system is to establish an integrated, comprehensive regionwide educational delivery system which includes telecommunications and computer-aided instruction technology as a method of linking metro-based resources with rural communities. It is also important to note that the technology transfer system would not only act as an "agent" for information, but as a "catalyst" as well. Funded research will be delivered to the free enterprise system, and problems of business and industry, especially small business, will also be identified as a target area for future research.

Technology transfer would provide access to available information left untapped for many people. It would include modified curriculum for remote telecommunications and would serve as an interdisciplinary catalyst that would incorporate peer education and training-of-trainers concepts into programs to maximize public and private partnerships. It would also accommodate resource links within communities, as well as among communities, and stimulate creation of small businesses through direct interface between education and economic development agencies.

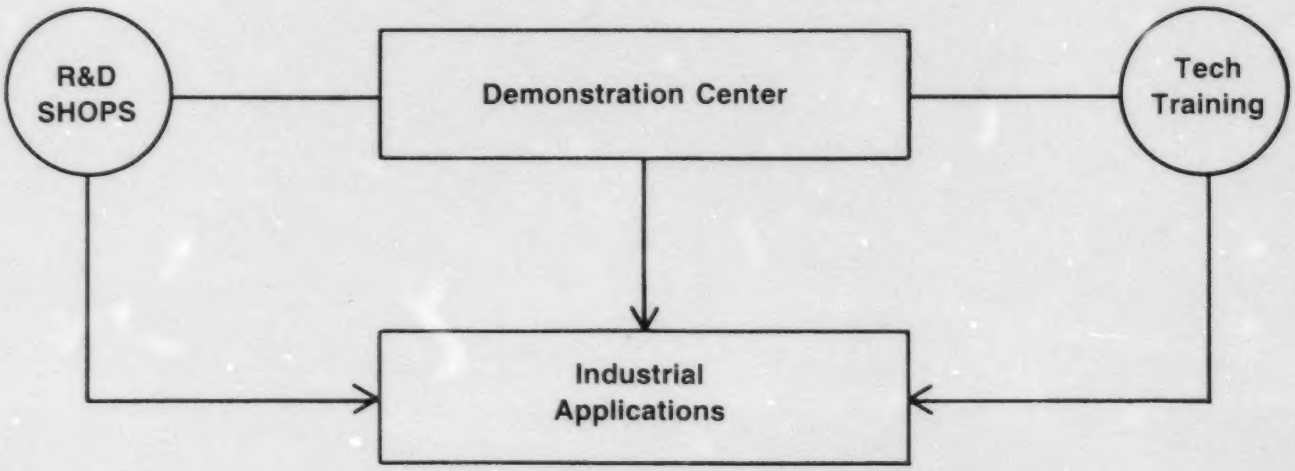
TECHNICAL SUPPORT REQUIREMENTS FOR COMMUNITY COLLEGES

These needs descriptions are illustrative only and do not necessarily represent the opinions of the American Association of Community and Junior Colleges or any other community college or association.

Advancement of High Tech Applications

Industry training packages: Translate standard industrial training for operators and technicians into curriculum packages for individual and group training, retraining and skills updating at the work sites.

CAD/CAM/CIM TRAINING



Needs:

- •••Computer hardware and software for demonstration Center
- •••Communications links to R&D shops and industry
- •••Creation of a national CAD/CAM/CIM data network
- •••Microprocessors dedicated for curriculum development
- •••Interactive equipment (e.g., video disc)
- •••Funding for curriculum standardization and translation to instructional computer formats

Vocational and General Education Support

Computer applications for the classroom: Microprocessors for every classroom and lab on campus and at integrated teaching sites.

1) To teach students how to operate computers and manipulate software to access and massage appropriate information
2) For problem-solving practice, to teach logical learning progressions, priority setting and cause-effect relationships
3) To reinforce process learning for technical students by introducing them to real-case simulations

Mini-cluster networks for technical training: Mini-host computers with clusters of smart terminals or micros dedicated to specific disciplines, including:

1) Networking for backup and cross-discipline projects
2) Dedicated peripherals, as needed for each discipline
3) Curriculum software for process learning and technical problem solving

Needs:

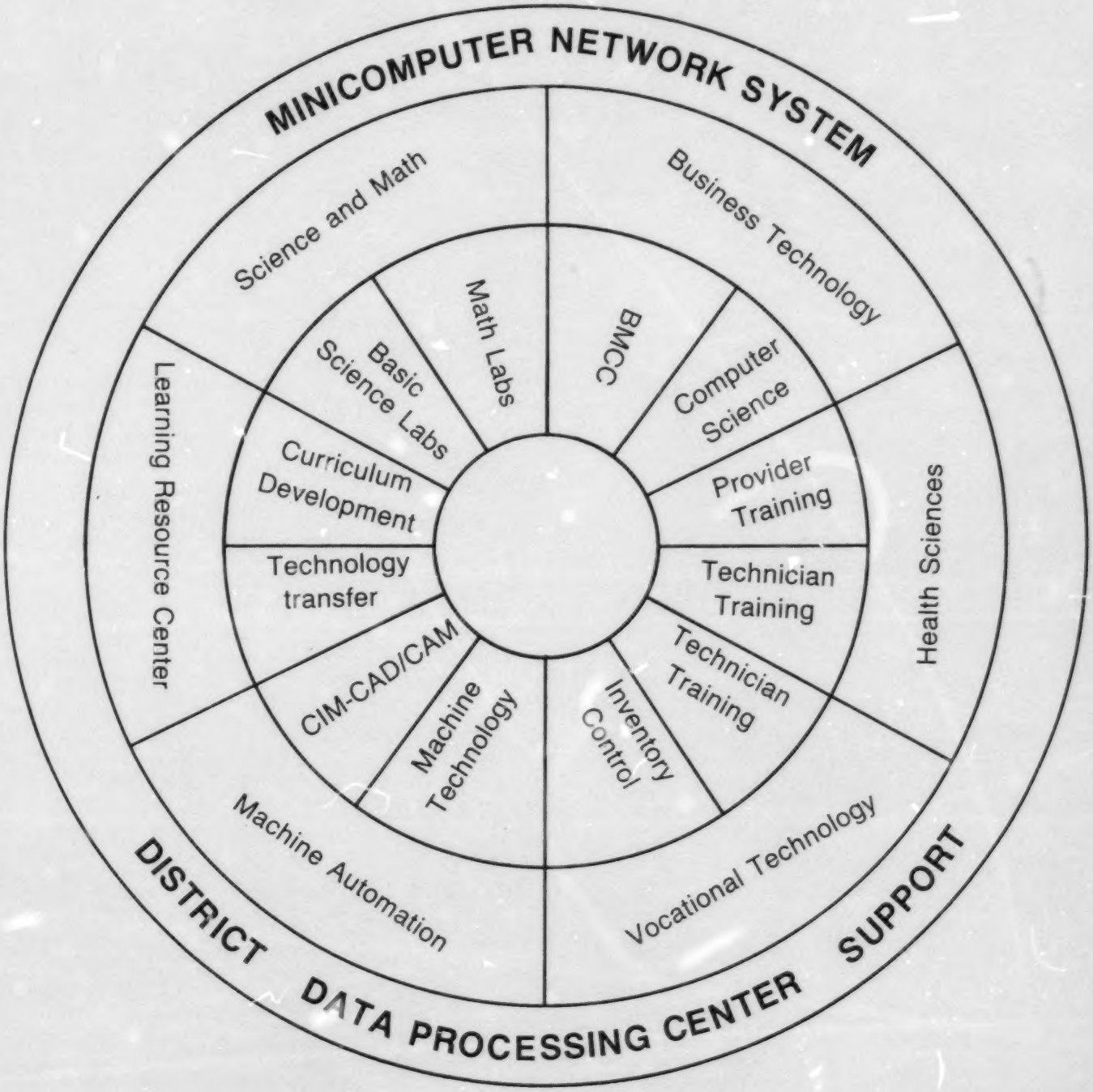
... Microcomputers and peripherals in sufficient quantity to provide ready access for all students

... Minicomputers and peripherals to function as hosts for clusters of microcomputers in technical and scientific applications

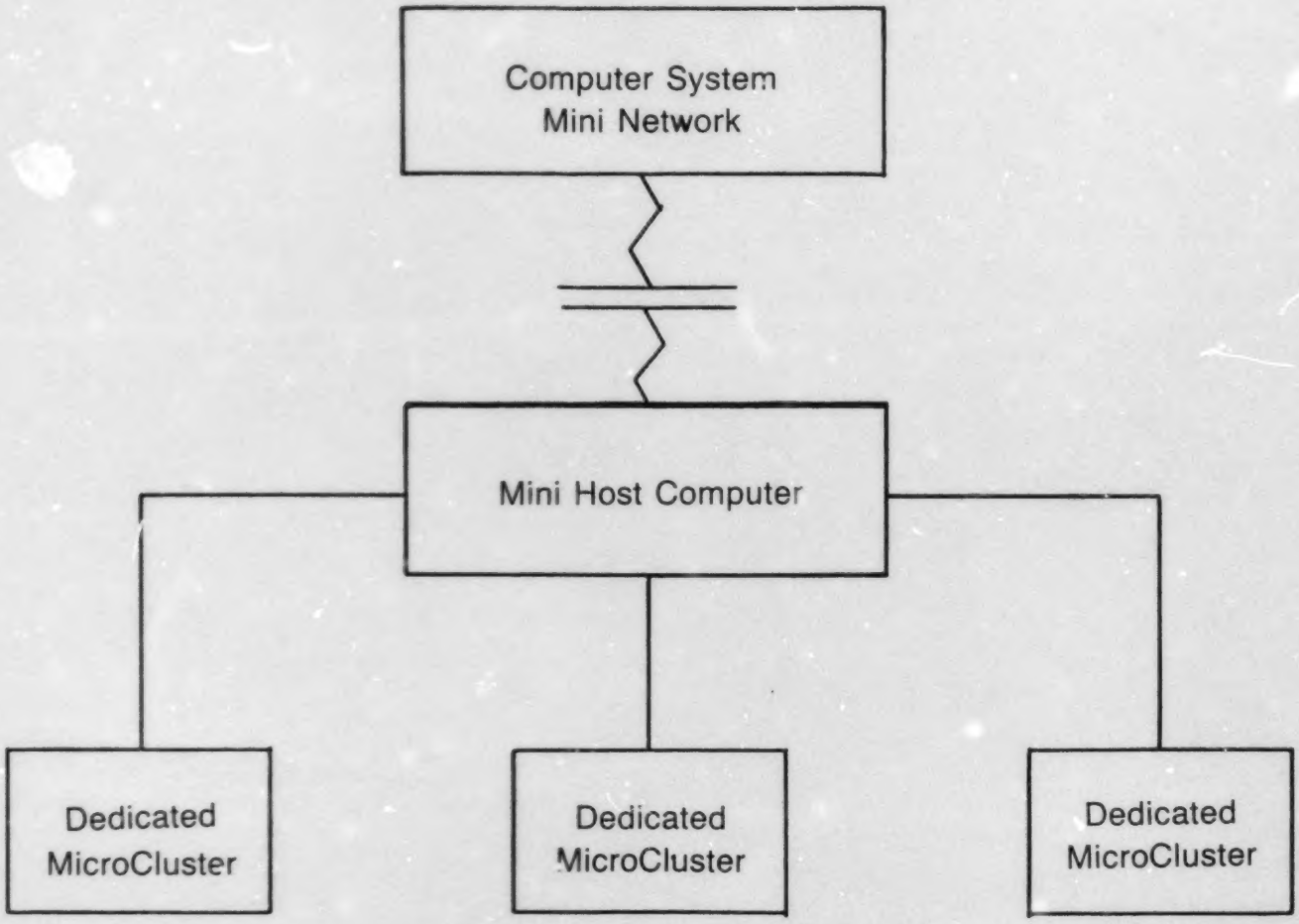
... Education software designed for the academic and technical disciplines of each community college

... National computer curriculum development resource to design supplemental curriculum for computer application in the classroom

COMMUNITY COLLEGES OF SPOKANE VOCATIONAL EDUCATION INSTRUCTIONAL COMPUTER RATIONALE



PROPOSED MINICOMPUTER NETWORK



TYPICAL SOFTWARE NEEDS

1. **Word Processing**	Total System
2. **CAD/CAM/CIM**	Total System
3. **Business Technology**	Computer user training packages Computer science curriculum support
4. **Health Sciences**	Provider/technician training simulation
5. **Vocational Technology**	Graphics, data analysis, technical problem solving, simulated industrial tasks, robotics programming, inventory control
6. **Math and Science Labs**	Curriculum support packages for applied mathematics and basic science
7. **Learning Resource Center**	Curriculum development software to create interactive courses and simulated work problems. Menu driven software accommodating sorting and categorizing of technical information

Administrative Support Systems

Information Management:

Financial management and planning

Student services support

Enrollment and registration

Faculty and teaching resources

Counseling and financial aid

Placement and retraining

Inventory and facilities management

Constituent records management

Needs:

... Minicomputers networked and in multi-user formats

... Microcomputer/smart terminals in all administrative areas

... Software specifically developed for community college administration

Technology Transfer Networks

Development of a national technical information network including access to current data bases and creation of new comprehensive data bases.

1) Menu-driven software to search network by area of need and cross references

2) Technical information stations at all community colleges in America, with computer links to the national network

3) Technical information facilitators to assist users in searching for desired information

Needs:

... Computer hardware support for the national technology transfer telecommunications system

... Financial support to create software and delivery systems for the national network

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